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SUPERFUND HEALTH RISK TECHNOLOGY SUPPORT CENTER

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LOCATION: Region II

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COMMENTS:

Attached is the memo to John Osolin
for the request submitted by Arlene Levin.
A hard copy will follow in the mail.

Windy Henson





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

DEC 17 1991

SUBJECT: Oral Toxicity Adjustment Factors and Dermal Absorption Factors (Witco Chemical Site/Oakland, NJ)

FROM: Kenneth A. Poirier *K.A. Poirier*
Director
Superfund Health Risk Technical Support Center
Chemical Mixtures Assessment Branch

TO: John Osolin
U.S. EPA
Region II

This memorandum is in response to a request submitted by Arlene Levin of Alliance Technologies Corporation, for oral toxicity adjustment factors and dermal absorption factors for chemicals found at the Witco Chemical Superfund site.

Attached please find the following information:

Attachment I: Oral Adjustment Factors

Attachment II: Dermal Absorption Information

The absorption values provided in the attachments were obtained from available EPA documents and ATSDR Toxicological Profiles. References have been provided following the presentation of the tables.

There were a number of chemicals for which no information was available. Due to time constraints, we were unable to conduct a literature search for each one of those chemicals. Please notify us if you would like us to conduct additional research. This additional research would take us about 8 weeks to complete.

For chemicals listed as ATSDR not available, please contact ATSDR directly to obtain the most current ATSDR documents.

Please Note: No absorption information was provided in the attachments for lead. ECAO recommends you consult your EPA regional contact for appropriate regional guidance on assessing exposure to lead.

If you need further assistance, please feel free to contact the Superfund Technical Support Center at (513)569-7300 or FTS 684-7300.

Attachments

cc: J. Dinan (OS-230)
P. Grevatt (Region II)
A. Levin (Alliance Technologies Corporation)
M. Maddaloni (Region II)
B. Means (OS-230)

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

VOLATILES

Acetone
(67-64-1)

Updated HEA 1989:
Animals: rats-by
gavage, acetone in
water rapidly
absorbed. HEA
1988: No
quantitative data;
readily absorbed

No ATSDR

Chloroform
(67-66-5)

Updated HEA 1988:
Humans: nearly
complete. Mice,
rats and Monkeys:
93-98%. HAD 1985:
Animals:
virtually
completely
absorbed.
Rats, mice, monkeys
93-98% recovery of
radioactivity in
exhaled air, urine
and carcass.
AWQCD 1980
Animals:
Approximately 100%

1991 Public
Comment Draft:
Humans: ~100%
absorbed rapidly.
Animals: 93-98%
absorption.

Oral Absorption Factors

<u>Chemical</u>	<u>EPA Document</u>	<u>ATSDR Profiles</u>
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1,2,4-Trichloro-
benzene
(120-82-1)

HEA 1987
Animals: Rats and
monkeys, 89-90%
absorbed.

No ATSDR

Trichlorofluoro-
methane (75-69-4)

DWHA 1989: No
quantitative data,
but expected to be
absorbed.

No ATSDR

1,2,4-Trimethyl-
benzene (95-63-6)

DWHA 1987: No
quantitative data,
but expected to be
absorbed.

No ATSDR

1,3,5-Trimethyl-
benzene

DWHA 1987: No
quantitative data,
but expected to be
absorbed.

No ATSDR

SEMIVOLATILES

Benzo(a)anthracene

DWCD 1990:
No data.

1990:
Humans: No data.
Animals: Rats:
Rapid and
efficient
absorption.

Benzo(a)pyrene
(50-32-8)

DWCD 1990:
Rats: Approx. 60%
in food; approx.
40% in starch
suspension.
HEA 1984: Rats:
Approx. 50% from
diet and starch
suspension.

1990
Humans: No data.
Rats: 1-3 % in
urine and 74-85%
in feces.

Oral Absorption Factors

<u>Chemical</u>	<u>EPA Document</u>	<u>ATSDR Profiles</u>
Benzo(b)fluor- anthene (205-99-2)	DWCD 1990: No data.	1990: No quantitative data.
Benzo(k)fluor- anthene (207-08-9)	No EPA Documents	1990: No quantitative data.
Bis(2-ethyl hexyl)phthalate (117-81-7)	DWCD 1986: Animals: >90% from feed in rats. HEA 1987: Animals: >90% from feed in rats. Humans: 10-15% excreted in the urine as metabolites.	ATSDR 1989: Humans: minimum of 15%. Animals: >90% in rats.
Butylbenzyl- phthalate (No cas#)	HEED 1989: Animals: Rats: 61-74% excreted in the urine. In ethanol/Emulphor 16.6% excreted in the urine. DWCD 1986: No quantitative data, on systemic effects following ingestion.	No ATSDR

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

Chrysene
(218-01-9)

DWCD 1990:
(Polycyclic
Aromatic
Hydrocarbons):
Animals: 5-50% in
diet or as
suspension in
starch solution.
HEEP 1984:
Animals: Rats:
62.4-74.6%.

1990: Humans: No
data. Animals:
Absorbed but not
quantified.
Extent of
absorption depends
on the oral dose
of chrysene and
vehicle of
administration.
Approx. 25-41% was
recovered from
feces within 72
hrs. Olive oil -
79% in feces
following dietary
and gavage
administration.

Di-n-butyl-
phthalate
(No cas #)

HEEP 1987:
Animal: Rat >90%
absorption. HEA
1987: Animals:
Rats-gavage >90%
excreted as
metabolites in the
urine, the
remainder was
excreted in the
feces
DWCD 1986:
Animal: Rat >90%
absorption.

1991: Animal:
Rat 63-97%
absorption.

Fluoranthene
(206-44-0)

DWCD 1990
(Polycyclic
Aromatic
Hydrocarbon): No
quantitative data.

1990: No
quantitative data
available.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

4-Nitrophenol
(No cas #)

HEA 1987:
(Nitrophenol): No
pertinent
quantitative data
located in
available
literature. HEEP
1985: Pertinent
data regarding
absorption of 2-
nitrophenol, 3-
nitrophenol or 4-
nitrophenol were
not located in
available
literature.
AWQCD 1980:
(Nitrophenols) No
pertinent data.

ATSDR not
available.

Phenanthrene
(85-01-8)

DWCD 1990
(Polycyclic
Aromatic
Hydrocarbon): No
quantitative data.
HEA 1984: No
specific data
regarding GI
absorption of
phenanthrene are
available. (Data
from other
structurally
related PAHs
suggest
phenanthrene is
readily absorbed
from GI tract)
HEEP 1987: No
pertinent data
located.

1990: No
quantitative data
available.

Oral Absorption Factors

ChemicalEPA DocumentATSDR Profiles

Phenol
(108-95-2)

AWQCD 1980:
Readily absorbed
but not
quantified.
Updated HEA 1989:
Readily absorbed
but not
quantified.

1989: Humans:
~90% absorbed.
Animals: Rats
95%; squirrel &
monkey 31%.

Pyrene
(129-00-0)

DWCD 1990
(Polycyclic
Aromatic
Hydrocarbon): No
quantitative data.
HEA 1984: Rats:
aqueous suspension
of pyrene was
poorly absorbed.
HEEP 1987:
Animals: Rats-
absorbed but not
quantified.

1989: No
quantitative data
available.

PESTICIDES/PCBs

4,4-DDD
(72-54-8)

No relevant EPA
documents.

4,4-DDE
(72-55-9)

AWQCD 1989: No
data.
AWQCD 1980:
Absorbed with high
efficiency. No
quantitative data.

1990 Human:
Absorbed but not
quantified.
Animal: 70-90 %.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

4,4-DDT
(50-29-3)

HEA 1988:
Animals: rats
estimated at 95%
of absorption of
dietary fats.
Humans: slow but
complete
absorption.
AWQCD 1989: No
data. AWQCD 1980:
~95% in dietary
fats.

1990:
Human: Absorbed
but not
quantified.
Animal: 70-90%.

Dieldrin
(60-57-1)

HEA 1987: Humans:
No data. Animal:
Some absorption
but not
quantifiable.
AWQCD 1980:
(Aldrin/Dieldrin)
*Cl-dieldrin:
Animals: Rats-
immediately
absorbed by upper
GI tract.
Absorption varies
with solvent used.

1991 Public
Comment Draft:
Humans: Dose-
related response
but not
quantifiable.
Animal: Slow
absorption but not
quantifiable.

INORGANICS

Aluminum
(7429-90-5)

HEA 1987: Humans:
Absorbed but not
quantified.
Animals: Absorbed
but not
quantified.

ATSDR not
available.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

Antimony
(7440-36-0)

AWQCD 1989: No
quantitative data.
Hea 1987: Human:
Little absorption
from GI tract
(probably < 1%)
for insoluble
oxides. Animal:
~ 15% absorption
for water soluble
organics.

1990 Public
Comment Draft:
Humans: 10%
antimony tartrate.
1% all other
forms.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

Arsenic
(7440-38-2)

HEA 1984: Humans:
>95% inorganic.
Rats, pigs and
monkeys: approx.
90% inorganic.
AWQCD 1980: Must
consider chemical
form and its
physical
characteristics.
Inorganic soluble
arsenic-
substantial
absorption of
trivalent (>95%).
Animal: either
III or IV form is
almost completely
absorbed.
Insoluble
arsenic tri-
selenide: poorly
absorbed. Arsenic
trioxide solution:
Rabbits/Rats (in
suspension): 40 &
30% abs. Monkeys:
98%. Pigs: 88%.
Arsenate solution
70 to 90% abs.
Shrimp or Seafood
arsenic: Rapidly
absorbed and
rapidly excreted.

1989: Humans:
>95% inorganic.
Animals: >90%
water soluble
salts; 30-40%
trioxide.
suspensions.

Barium
(7440-39-3)

DWCD 1985:
Animals: 3-11%
gavage. HEA 1984:
Pertinent data not
located in
available
literature.

1990 Public
Comment Draft:
Humans: <5%.
Animals: Dogs 7%;
Rats <22 days old:
63-84%. Rats > 22
days old: 7%.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

Beryllium
(7440-41-7)

HAD 1987: Human:
No data. Animal:
<1% absorbed. DWCD
1991: < 1%
absorption. Guinea
pigs-0.006%
absorption.

ATSDR not
available.

Chromium
(7440-47-3)

HAD 1984: Humans:
0.4% Cr III; 10.6%
Cr VI. Animals:
<3% Cr III. Rats:
2.3% Cr VI.
HEA 1984: Humans:
2.1% Cr VI.
Animals: 3-6% Cr
VI. HAD 1984: No
pertinent data.
AWQCD 1980: Low
absorption,
<1% depending on
chemical form in
which the element
is ingested.

1989: Humans: 0.4%
Cr III; 10.6% Cr
VI. Animals: 1.4-
3.0% Cr III; 2.4%
Cr VI.

Chromium, total

No EPA Documents

No ATSDR

Oral Absorption Factors

ChemicalEPA DocumentATSDR Profiles

Cobalt
(7440-48-4)

HEA 1991 Revised
1st Draft: Human:
18-97% depending
on dose of cobalt
compound given and
nutritional status
of subjects. 31%
abs. in iron-
deficient
subjects. 18-44%
in non-deficient
subjects. Animal:
~30% gavage cobalt
chloride. (more
soluble compounds
of cobalt were
more readily
absorbed than less
soluble
compounds).

1990 Public
Comment Draft:
Humans: 18-97%
depending on type
of cobalt, dose
and nutritional
status. Animals:
Rats: 30%.

Copper
(7440-50-8)

HEA 1984: Humans:
15-97% absorption.
DWCD 1987: Human
15-97% absorption.
AWQCD 1980:
Humans: 40 to 60%
dietary copper
absorbed.
Animals: Absorbed
but not
quantified.

1991: Humans:
15-97% copper
acetate.

Iron
(7439-89-6)

HEA 1984: Humans:
Heme Iron 10-25%;
non heme 1-10%.

Magnesium
(7439-95-4)

No EPA Documents

No ATSDR

Oral Absorption Factors
ChemicalEPA DocumentATSDR Profiles

Manganese
(7439-96-5)

DWCD 1986:
Humans: Approx.
3%. Animals: Rats
approx. 3%. DWCD
1991: Human:
Studies ranging
from: $-2.0 \pm 4.9\%$
to $8.4 \pm 4.7\%$.
Calcium may
inhibit absorption
by increasing
alkalinity.
Animals: 3-4%.

1990 Public
Comment Draft;
Humans 3-5%. Rats:
2.5-5.5%.

Mercury
(7439-97-6)

DWCD 1987:
Humans: 7%
mercuric nitrate
95% methyl
mercury. Animals:
Rats: 1-2%
mercuric chloride
7% mercuric
chloride in milk;
suckling mice-38%;
species not
specified 0.01%
(metallic).
HEA 1984: Humans:
High rate (methyl
mercury); 15%
(mercuric nitrate)
AWQCD 1980:
Virtually complete
abs. Absorption
of metallic
mercury in liquid
form is believed
to be very small
($<0.01\%$ in
animals).
Inorganic mercury:
human $<15\%$.

1989: Humans: 0.1%
(metallic), 15%
(mercuric
nitrate), ~95%
(methylmercuric
nitrate). Animals:
suckling mice -
38%, adult mice -
1% (standard
diet), 7% (milk
diet); mice-80%
(organic mercury).

Oral Absorption Factors

<u>Chemical</u>	<u>EPA Document</u>	<u>ATSDR Profiles</u>
Nickel (7440-02-0)	HEA 1986: Humans: 1-10%. HAD 1985: Human: 1-10% absorption, dependent on dietary composition. AWQCD 1980: Human 1-10% absorption.	1988: Humans: 1-10%. Rats, dogs and mice: 1-10%
Selenium (7782-49-2)	HEED 1989: Selenites, selenates and seleniferous compounds in mammals is rapid and efficient, but metal selenides & elemental selenium are absorbed poorly. HEA 1984: By gavage rats-91- 93% seleno- methionine. Humans: 70, 64, 44% selenite selenium. AWQCD 1980: Human: 70, 64, 44% of administered dose. Animal: Rats- selenite 91-93%. selenomethionine 95-97%.	1989: Humans: 80-97%. Animals: 80-100%.
Silver (7440-22-4)	AWQCD 1989: Animals: 1-3% absorption.	ATSDR not available.

Oral Absorption FactorsChemicalEPA DocumentATSDR Profiles

Thallium
(7440-28-0)

AWQCD 1989
addendum: No data.
AWQCD 1980:
Completely
absorbed, not
quantified.

ATSDR not
available.

Vanadium
(7440-62-2)

HEA 1987: Humans:
0.1-1%. WQHA
1989: Human: 0.1-
1.0% absorption
with a mean of
~0.5% rats fed
vanadium sulfate.

1990 Public
Comment Draft:
Humans: No data.
Animals: Rats
2.6%.

Zinc
(7440-66-6)

HEA 1984: (Zinc
and compounds):
Human: 20-80% zinc
chloride. Animal:
very small amounts
absorbed but not
quantified.

ATSDR not
available.

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

ATTACHMENT II

Volatiles

Acetone	Updated HEA 1989: No information available.	No ATSDR
Chloroform	Updated HEA 1988: No information. HAD 1985: Slow absorption, no quantitative information.	1991 Public Comment Draft: Human: No data. Animal: No pertinent data.
1,2-Dichloro- benzene	HEA 1987: No information.	No ATSDR
1,3- Dichlorobenzene	HEA 1987: No information.	No ATSDR
1,4- Dichlorobenzene	HEA 1987: No information. AWQCD 1980: Absorbed but not quantified.	1991 Public Comment Draft: No studies located for human or animal.
Tetrachloro- ethylene	AWQCD 1980: Human: Absorbed but not quantified.	1991 Public Comment Draft: Human: $\leq 1\%$ absorption. Animal: Absorbed but not specifically quantified.
1,2,4-Trichloro- benzene	HEA 1987: No information.	No ATSDR
Trichlorofluor- methane	No EPA Documents	No ATSDR

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

1,2,4-Trimethyl-
benzene

DWHA 1987:
Percutaneous
absorption but not
quantified.

No ATSDR

1,3,5-Trimethyl-
benzene

DWHA 1987:
Percutaneous
absorption but not
quantified.

No ATSDR

SEMIVOLATILES

Benzo(a)anthracene

DWCD 1990: (PAHs)
Absorption
dependent on
molecular size,
structure and the
nature of the
solvent. Small
amounts of mineral
oil enhance dermal
absorption.
However, the
absorption was not
as great when a
mixture of 50%
mineral oil was
used as the
solvent.

1990 Human: No
information.
Animal: Rats-
52.3% absorption.
Over time,
permeation
significantly
decreased
suggesting it is
dermally absorbed
in a dose-
dependent manner.
Diffusion through
skin depended on
the amount of
anthracene on
skin's surface.

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

Benzo(a)pyrene

DWCD 1990: (PAHs)
Animal: Rats ~90%
absorption.
Depends on size
and configuration
of the hydrocarbon
molecule and the
concentration of
hydrocarbon
applied to the
skin.

1990: An in vitro
study using human
skin revealed 3%
absorption after
24hrs. Animal:
6% and 40%, at 1
and 24 hours
following
administration,
respectively.
Seven days after
exposure 93% was
recovered in the
feces.

Benzo(b)fluor-
anthene

DWCD 1990: (PAHs)
No information.

Benzo(k)fluor-
anthene

DWCD 1990: (PAHs)
No information.

Bis(2-ethyl-
hexyl)phthalate

No EPA Documents

No ATSDR

Butylbenzyl-
phthalate

HEED 1989: No
information.

No ATSDR

Chrysene

HEEP 1984: No
information. DWCD
1990: No
information.

1990: Human: No
information.
Animal: Absorbed
but not
quantified.

Di-n-butyl-
phthalate

DWCD 1991:
(Phthalic Acid
Esters) No
information.

ATSDR not
available.

Fluoranthene

DWCD 1990: No
information.

1990: No
information.

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

4-Nitrophenol

HEA 1987:
(Nitrophenols)-No
information.
HEEP 1985:
(Nitrophenols)-
Animals: Dogs:
~11% urine; <0.5%
feces. Rabbits ~35%
urine; 0.53%
feces.
AWQCD 1980: No
pertinent
information.

ATSDR not
available.

Phenanthrene

HEEP 1987: Highly
soluble can pass
across epithelial
membranes-no
quantitative data.
HEA 1984: No
information.

1990: No
information.

Phenol

AWQCD 1980:
Readily absorbed
but not
quantified.

ATSDR not
available.

Pyrene

HEEP 1987: No
information.
HEA 1984: No
information.

1990: No
information.

Pesticides/PCBs

4,4-DDD

No relevant EPA
documents.

ATSDR not
available.

4,4-DDE

AWQCD 1989: No
information. AWQCD
1980: No
information.

ATSDR not
available.

Dermal Absorption Factors

<u>Chemical</u>	<u>EPA Documents</u>	<u>ATSDR Profiles</u>
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4,4-DDT

AWQCD 1989: No
information. AWQCD
1980: No
information.ATSDR not
available.

Dieldrin

AWQCD 1980: No
information.
HEA 1987: No
information.1991 Public
Comment Draft:
Humans: Rapid
absorption-7.7%
but low confidence
in study cited.
Animals: Rats:
Rapidly absorbed
but not
quantified.**INORGANICS**

Aluminum

HEA 1987: No
information.ATSDR not
available.

Antimony

HEA 1987: No
information.ATSDR not
available.

Arsenic

AWQCD 1989: No
information.
AWQCD 1980:
Human: No
pertinent data.
Animal: Rats-
solutions of
arsenate,
significant
absorption but not
quantified.1991 Public
Comment Draft: No
quantitative
studies were
located on
inorganic arsenic.

Barium

HEA 1984: No
information.ATSDR not
available.

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

Beryllium

DWCD 1991:
Animals: Rats-
poorly absorbed
although contact
dermatitis can
occur.
HEA 1987: No
information.
HEA 1984: No
information.
AWQCD 1980: No
information.

ATSDR not
available.

Chromium (VI)

HEA 1984: No
information.
HAD 1984:
Absorbed but not
quantified.
AWQCD 1980:
(Chromium)VI
fairly readily
absorbed however
not quantified.

ATSDR not
available.

Chromium (Total)

ATSDR not
available

Cobalt

HEA 1991 Revised
1st Draft: No
data.

ATSDR not
available.

Copper

DWCD 1987: No
pertinent
information.
AWQCD 1980: No
pertinent data.

ATSDR not
available.

Iron

HEA 1984: No
information.

No ATSDR

Magnesium

No EPA documents.

No ATSDR

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

Manganese

DWCD 1991: No
information.ATSDR not
available.

Mercury

AWQCD 1989: No
information.
AWQCD 1980:
Inorganic mercury:
No quantitative
information.
Mercuric chloride:
Animals: 5%.
Humans: expect
substantial
absorption but not
quantified.ATSDR not
available.

Nickel

AWQCD 1980:
Human: absorbed
but not
quantified.

Selenium

AWQCD 1989: No
information.
HEED 1989: No
information.
HEA 1984: No
information.
AWQCD 1980: No
pertinent
information -
absorption
enhanced by sweat
and detergents.ATSDR not
available.

Thallium

AWQCD 1989: No
information.
AWQCD 1980:
Absorbed but not
quantified.ATSDR not
available.

Dermal Absorption Factors

ChemicalEPA DocumentsATSDR Profiles

Vanadium

WQHA 1989:
Animals: Rabbits:
absorbed but not
quantified.
Human: absorbed
but not
quantified.

ATSDR not
available.

Zinc

HEA 1984: No
information.

ATSDR not
available.

References

HEA - Health Effects Assessment

U.S. EPA. 1989. Updated Health Effects Assessment for Acetone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1987. Health Effects Assessment for Aldrin/Dieldrin. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1987. Health Effects Assessment for Aluminum. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1987. Health Effects Assessment for Antimony. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1984. Health Effects Assessment for Arsenic. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1984. Health Effects Assessment for Barium. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

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Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

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